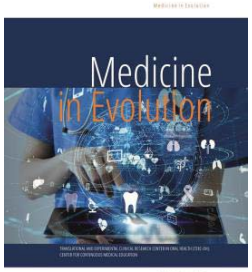
Pit and fissure sealants. Prevention by sealing



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Abstract

Aim and objectives; This study aimed to assess the caries-prevention benefit and to demonstrate the effectiveness of pit and fissure sealants in preventing caries and the management of early carious lesions.

Material and methods; the selection factors for performing the sealing procedure consisted in: the patient's ability to cooperate, age, dental status, depth of grooves and fosses, eating habits but also fluoride prophylaxis in the past and present.

Results; The glass ionomer sealant was less retentive when compared to resin sealants. The caries incidence between the glass ionomer and resin-based sealants was not statistically significant.

Conclusions; Pit and fissure sealant is an effective means of preventing pit and fissure caries in primary and permanent teeth.

Keywords: grooves, fosses, prophylactic means, oral hygiene, occlusal face, preventive filling, tooth decay, temporary and permanent molars

INTRODUCTION

It is known that in the first year after the eruption, a molar can store plaque in the retention areas. They are sensitive to caries due to the retentive relief, the increased permeability of the tissues after the eruption, the low fluoride content and the increased sensitivity to acid attack. [1] Sealing teeth is among the 4 methods of preventing dental careies, along with general and local fluoridation, food hygiene and oro-dental hygiene. It is known that sealing the teeth participates, by mechanically blocking them, in increasing the resistance of hard dental structures to caries attack, representing the best prophylactic method to prevent the formation of occlusal caries. [2]

Sealing is an effective method of preventing occlusal caries of molars and premolars. It prevents food retention, and thus the deposition of bacterial plaque at this level. The process consists in applying a sealing material represented either by a glass ionomer cement with or without fluorine release or by a fluid composite material on the occlusal surfaces, transforming them from deep grooves into shallow, smooth grooves. [3] The process is minimally invasive, short-lived, time-consuming and low in cost. Sealing is practiced in children, on 6 and 12 year old molars, but it can also benefit children with mental problems or low socio-economic level. [4]

A preventive restoration is the method by which the treatment of a minimal occlusal caries is combined with the sealing of grooves and fosses. All these methods are non-invasive because they are processes that are part of prophylaxis. [5]

In the first year after the eruption, a molar stores plaque in the retention areas, they are sensitive to caries due to retentive relief, still increased tissue permeability after the eruption, low fluoride content and high sensitivity to acid attack. [6] The first stage of caries begins with the two independent bilateral lesions, which occur in the enamel of the cusp slopes, near the occlusal groove. It continues its development comprising the walls of the groove, continuing towards the prismatic structure, and then extending.

Due to the union of the two lesions at the base of the occlusal groove, its demineralization takes place. It was found that the demineralization of the walls of the groove occurs before its base, due to the existence of an organic body that has the ability to stop acidic metabolites of dental plaque at the base of the groove, the acid attack being slowed. [7] The evolution of the lesion is influenced by the increased amount of protein at the base of the groove, acting as a barrier in the advancement of caries ensuring remineralization. [8]

The very high incidence of carious processes in the molars in general, both permanent and temporary, requires the application of methods - different depending on the degree of coronary destruction, radical or curative. Molars generally play a special role in both temporary and permanent dentition but are particularly sensitive to caries. For these reasons, a number of methods have been tried to prevent the occurrence of caries at this level. An important role was played by the methods of preventing dental caries by administering fluorine-based products locally. [9-11] However, it has been shown that fluoride provides a more representative selective protection at the level of smooth surfaces and only partially at the level of occlusal faces. At their level, due to the difficult relief, inside them there are permanent food debris, microorganisms and air, difficult, even impossible to remove with the help of mechanical brushing, thus favoring the appearance of carious lesions. These areas with high cariogenic potential have been studied since ancient times. Currently, an important role in caries prophylaxis plays the method of sealing groves and fosses with sealing materials such as glass ionomer cements or composites, able to protect the tooth especially for the period of migration to the occlusion plane. Sealing groves and fosses is a method of

preventing tooth decay in the grooves and occlusal fosses, but also in the fosses on the vestibular and oral surfaces of the molars and orals of the upper incisors. In essence, it is a method of isolating them from the environment by applying and maintaining by a mechanical bond a resinous material on the enamel surface, previously demineralized. [13-15]

In conclusion, in the first 3 years after the eruption, it is good to achieve an efficient sealing of the occlusal surfaces of the molars in order to prevent their carious processes. Today, sealing grooves and fosses is the most important method of preventing tooth decay. Preventive fillings are an alternative method for limited carious processes that replace both past amalgam fillings and composite fillings. [16, 17]

Aim and objectives

The aim of this study is comparing the retention and caries preventive effect of the glass-ionomer fissure sealant and resin-based fissure sealant.

MATERIAL AND METHODS

There is a discussion of the appearance of caries secondary to sealing, and the objective of this paper is to explain the ambiguities regarding this topic. For example, if the sealing is performed on a completely clean surface, without incipient carious lesions and without retention of bacterial plaque, and the conditions of a proper isolation are fulfilled, the sealing will be long lasting. The success of a seal depends on the strictness with which the dentist observes the working technique but also the instructions for use recommended by the manufacturers. Although the working technique is relatively simple, each step must be performed very carefully, without compromise, so that the adhesion of the material to the tooth surface is the desired one. The technique of sealing pit and fosses with composite resins has the following sequence of steps: cleaning the tooth surface (fig. 1), isolation (fig. 2), acid etching (fig. 3), washing and drying, preparation of the sealing material (depending on the presentation method), application of the sealing material (fig.5), verification of the sealing, control in occlusal relation (fig.6), and periodic controls.

In conclusion, in the first 3 years after the eruption, it is good to achieve an efficient sealing of the occlusal surfaces of the molars in order to prevent their carious processes. When the caries process occurs at the level of temporary teeth or baby teeth, as they are also called, permanent teeth are also prone to bubbling.

Figure 1. Professional brushing of the occlusal surface

Figure 2. Isolation of the prosthetic field

Figure 3. Acid enamel etching

Figure 4. Application of the adhesive followed by light curing

Figure 5. Application of sealing material

Figure 6. Occlusion check after sealing

Figure 7. Final form of sealing

The 6-year-old molar has a special importance in the development of occlusal relationships and was highlighted by Angle who considered it the key to occlusion. Its eruption is a special morphological event, because by its early appearance, it simultaneously establishes the distal limit of the canine-premolar corridor but also the anterior limit of the molar corridor. He is also the reason for the second rise of the occlusion. The 12-year-old molar is located distal to the first molars and mesially to the mental molars. They are especially important in mastication.

For an integral dental arch, which fulfills the functions of mastication, phonation and aesthetics, prevention is particularly important. I chose as a method of prevention the sealing of grooves and fosses. It is an easy to practice, effective and non-invasive method.

We conducted this research on a number of 50 patients, aged 6-14 years. The selection factors for performing the sealing procedure consisted in: the patient's ability to cooperate, age, dental status, depth of grooves and fosses, eating habits but also fluoride prophylaxis in the past and present. The data obtained were notified in a chart containing the identity data, the general clinical and dental examination and the evolution over time. As a material we used light curing agents and we practiced light curing with ultraviolet light and also used even if at a lower number of seals and classic glass ionomer cement that contains a powder and a liquid the finished material resulting from mixing the two components. The external reaction obtained lasts 1-2 minutes.

The bacterial plaque and debris from the enamel surface was removed with a professional brush made with a special paste, after which I washed and dried it well with air spray. As a method of isolation we used cotton a roll, the rubber dam is being difficult to apply to a young patient. Next, the demineralization of the enamel was performed with a demineralization agent for 5-10 seconds. I washed the enamel surface with the air and water spray again. Finally, we applied the sealant to the tooth, evaluated the occlusion and recalled the patient for a periodic evaluation. A single application was performed, followed by periodic monitoring to determine the proportion and incidence of caries.

RESULTS

In the clinical research conducted in this study we targeted a group of 50 patients, aged between 6 and 14 years, of both sexes. The data obtained in this study are intended to inform both about the importance of dental hygiene from an early age and about the importance of sealing the grooves and deep fosses of 6- and 12-year-old molars from the first months after the eruption. The group with ages (fig. 8) between 6 and 9 years of age had the greatest need to seal the 6-year-old molars in order to prevent the extension of carious lesions from the temporary teeth. For this reason the first molar is also considered the tooth with the highest indication of sealing. From the segment aged between 9 and 14 years, only 5 patients

presented grooves and fosses that allowed self-cleaning, the remaining 15 patients required the sealing of the second molars.

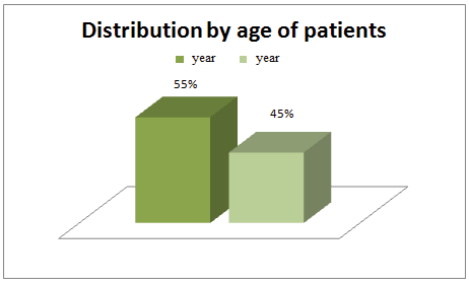

Figure 8. Distribution by age

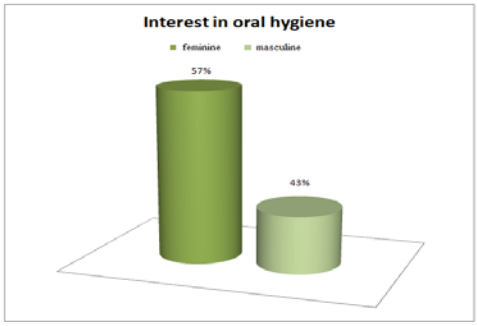

Figure 9. Interest in oral hygiene

From the total number of 50 patients, 21 were male and 29 were female. There were no significant differences in the depth of the grooves and fosses to be sealed. The occlusal surfaces of the first and second molars in girls and boys were also sealed. However, there was a greater concern for hygiene in females compared to males. (fig. 9) To make the seals we used composite materials and glass ionomer cement, which are the recommended materials for this work. We used glass ionomer cement in smaller quantities, predominating composite materials of different colors for children. (fig. 10)

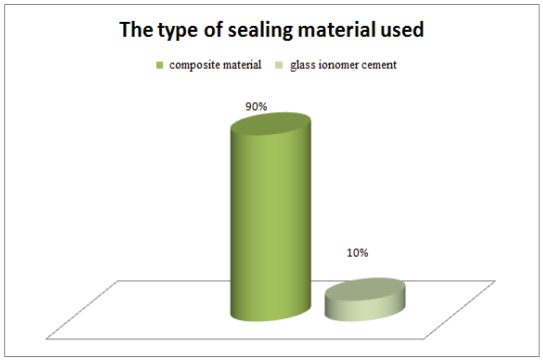

Figure 10. Type of sealing material

We applied the sealing material to all molars with occlusal surface on which narrow and deep grooves and fosses were clinically visible, which prevented a proper self-cleaning and sanitation. In the study we applied 15 seals to the upper first molar, 20 to the lower first molar, 9 to the upper second molar and 6 for the lower second molar. (fig. 11)

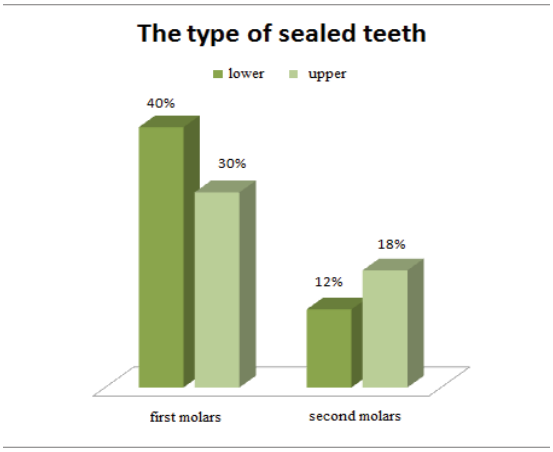

Figure 11. The type of sealed teeth

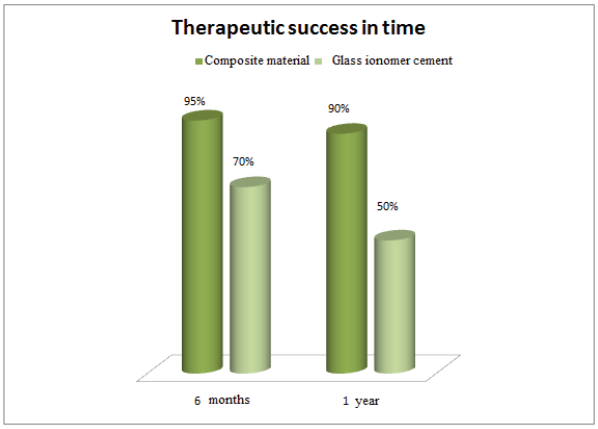

Figure 12. Therapeutic success timeline

Over time, the success rate (table 1) of glass ionomer cement was significantly lower than that of composite. At the control after 6 months, the composite was present in grooves and fosses in a proportion of 95%, while the glass ionomer cement proved a weaker resistance, being present in a proportion of only 70%.

Upon verification after one year, the composite was 90% present and the glass ionomer cement only 50%. (Fig. 13)

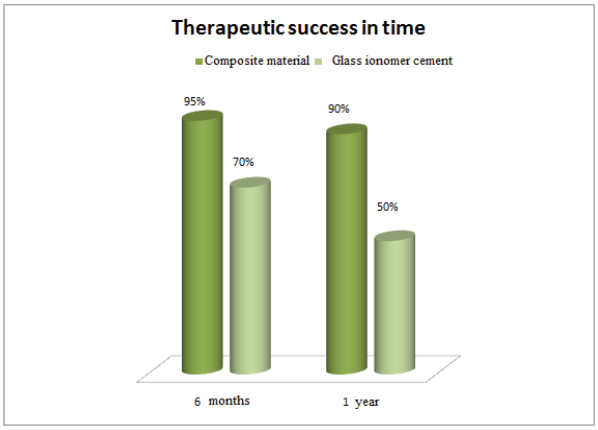

Figure 13. Therapeutic success rate by material

Table 1. Therapeutic success rate over time

Material type	Successes / duration	
	6 months	1 year
Composite material	95%	90%
Glass ionomer cement	70%	50%

By risk groups we can make a classification based on the degree of oral hygiene, the type of occlusion, the morphology of the teeth, we are especially interested in the depth and size of the grooves and fosses and last but not least the constitution of the enamel. While studying these aspects, we found patients with a low risk group of 20%, medium 55% and high of 25%. (fig. 14)

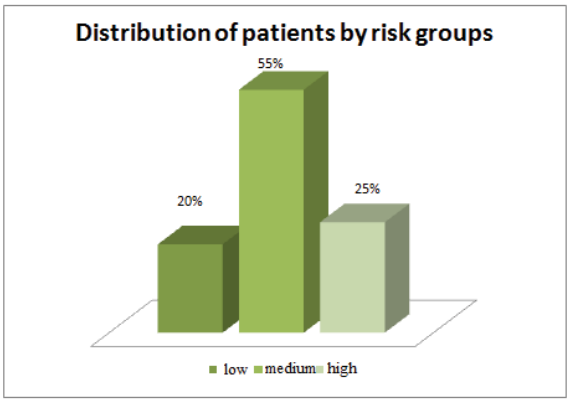

Figure 14. Risk groups

The efficient marginal closure and the degree of microbial permeability that is achieved after sealing is different depending on the layer of hard tooth substance in which the cavity expands. The efficiency is 60% in terms of enamel. Regarding enamel and dentin the efficiency is 30% and when the cavity has extended to the dentin the efficiency is only 10%. (fig. 15)

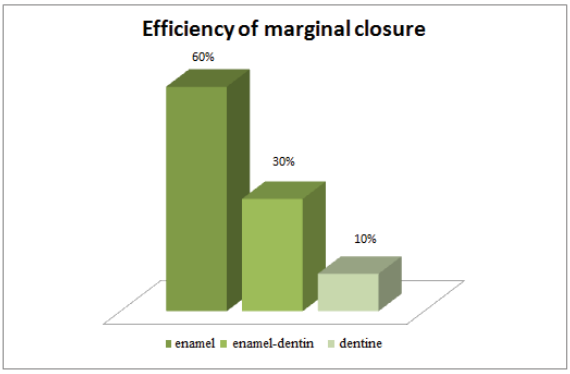

Figure 15. Efficiency of marginal closure

DISCUSSIONS

Because to the high prevalence of caries occurring on the occlusal surfaces, the impossibility of proper sanitation at the occlusal surfaces and the inefficiency obtained only by means of fluoridation at this level forced the search for another method to block or define

areas at high cariogenic risk. The procedure was applied after the eruption of permanent teeth with the aim of protecting them for life. [18]

Sealing materials are thin layers of composite or glass ionomer cement which are applied in the grooves on the occlusal surface of the first and second molars, to protect them from carious lesions. Most caries in children and adolescents occur at this level. Sealants protect the occlusal surface from tooth decay by keeping germs and food particles away from this area. This prophylactic procedure has been used for several decades, and is not considered a composite posterior restoration. The loss of sealing rate is about 5-10% per year which means that these teeth have the same incidence of risk as unprotected teeth. [19]

The success of an effective seal depends on the retention of the seal and the control at least 2 times a year. Thus, studies show that a seal could last up to 5-10 years. Caries affects the permanent tooth. Sealants protect it. They save time, money and the inconvenience of filling cavities. Sealing is the most effective way to prevent tooth decay in the grooves and fosses of the molars. The method consists in applying on the occlusal surface of the teeth, a thin layer of fluid composite or glass ionomer cement. The deep surface is thus transformed into a smoother one and favorable to self-cleaning. [19]

Isolation is an essential step for successful sealing. The most common reason for failure to seal may be incorrect insulation of the engraved enamel from saliva contamination. There were some parents who expressed concern that caries could form under seal. Sealing is performed on a clean surface, without carious lesions or bacterial plaque, only in this way the procedure will be successful. It is a simple, minimally invasive method that is practiced in a relatively short time. [20]

It is recommended that sealing be performed 6 months after the tooth eruption. Sealing should be done preferably on teeth with deep grooves and fosses, molars and premolars that prevent proper sanitization. Sealing is generally practiced on permanent teeth, but some authors say that it can also be done on temporary teeth that have an increased risk of caries. If the rules of oral hygiene are strictly observed, there are very good results over time. In case of failure due to loss of material, it can be reapplied whenever needed. Although sealants are lost over time, they provide ideal protection throughout the period of increased risk of caries. First molars have an increased incidence of caries which leads to their early loss, and by sealing them we prevent this.

CONCLUSIONS

Pit and fissure sealant is an effective means of preventing pit and fissure caries in primary and permanent teeth. It is important to make an efficient sealing of the occlusal surfaces of the molars in the first years after the eruption, in order to prevent their carious processes. Today sealing is the most important method by which we can prevent tooth decay. The costs of a seal are significantly lower than a complete restoration, and the dental substance is preserved.

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